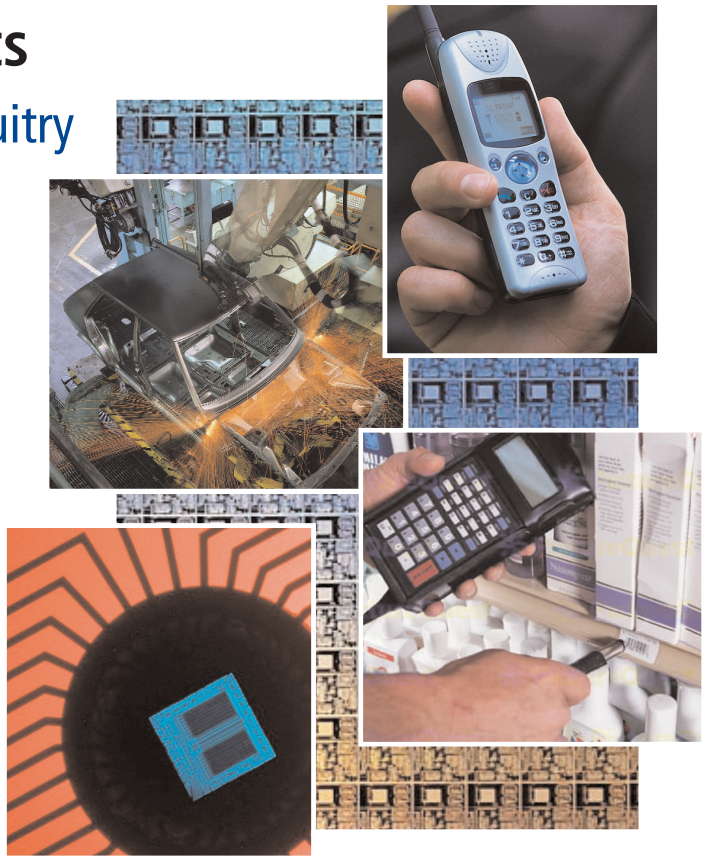
Spray-On Circuits

In-Situ Thin-Film Circuitry



NASA offers companies

the opportunity to license a revolutionary process that can permanently bond ultrathin markings, including complex integrated circuits, onto most surfaces.

Researchers at NASA Marshall Space Flight Center developed a new thin-film deposition process that creates a permanent bond between the film and substrate. This patented process, known as vacuum arc vapor deposition (VAVD), can be performed using a traditional vacuum chamber or a hand-held vacuum device developed by NASA. Applications are numerous, including a new method for creating integrated circuits, such as smart tags, radio frequency identification devices (RFID), and memory devices.

Benefits

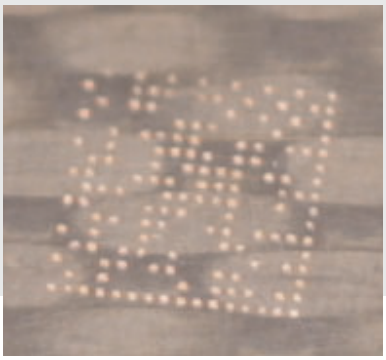
- Deposits thin films in-situ on virtually any metallic and some nonmetallic surfaces
- Applies easily using a vacuum chamber or portable hand-held device
- Creates a permanent bond between the film and substrate
- Produces very thin, high-quality films
- Uses masks to produce high-definition symbols or integrated circuits
- Improves the deposition rate compared to other processes
- Eliminates hazardous wastes or by-products

National Aeronautics and Space Administration

Commercial Applications

VAVD technology can be used to create any kind of mark or film on a part. Typical marks include simple patterns for bar codes or two-dimensional data matrices and complex patterns for RFID or memory devices. VAVD is useful for a number of industrial applications, including:

- Asset tracking
- Inventory management
- Component health monitoring
- Smart cards
- Smart devices
- Wireless communications



In this VAVD sample, a matrix symbol made of copper is sprayed onto a graphite composite.

The Technology

The aerospace industry has been seeking new marking methods that are safe and can withstand harsh environments. To address this need, NASA developed the VAVD process, which uses a vacuum chamber system to produce vapor deposits. VAVD is capable of high deposition rates, yet produces no hazardous wastes or by-products.

The VAVD technology can produce thin-film coatings in the form of small, high-fidelity part identification symbols that can be read by humans or machines. VAVD can also provide an alternative semiconductor manufacturing process. With VAVD, integrated circuits can be permanently built onto the substrate of virtually any part using layers of thin-film deposition. Because the size and operation of a traditional vacuum chamber limits both the size and volume of parts being marked, NASA developed a portable hand-held vacuum device that can apply markings. Thin-film deposition can be made in-situ on virtually any metallic and some nonmetallic materials.

NASA has tested VAVD with a number of films and substrates. Types of thin films sprayed include chrome, copper, aluminum, stainless steel, titanium, gold, silver, silicon, cobalt, iron, nickel and various ceramics. Types of substrates include various metal surfaces, PVC, ceramics, paper, mineral surfaces such as rocks, and feathers.

With VAVD, sensors, circuits and similar devices can be integrated into the surface of a structure without being in the way or becoming detached.

Partnering Opportunity

The VAVD technology portfolio includes issued and pending patents. This technology is part of NASA's technology commercialization program, which seeks to stimulate commercial use of NASA-developed technologies. NASA invites companies to consider using this technology through exclusive, non-exclusive or exclusive field-of-use licensing.

For More Information, Please Contact:

RTI INTERNATIONAL

Jeff Cope, RTI
NASA Technology
Applications Team
Phone: 919.990.8478
Fax: 919.541.6221
E-mail: jcope@rti.org

Sammy Nabors
NASA Marshall Space Flight Center
Technology Transfer Department
Phone: 256.544.5226
Fax: 256.544.4810
E-mail: sammy.nabors@msfc.nasa.gov

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